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44,961/59

COMMONWEALTH OF AUSTRALIA
PATENT SPECIFICATION

Complete Specification Lodged 12th January, 1959.

Application Lodged (No. 44,961/59) 12th January, 1959.

Applicant (Actual Inventor) Godtfred Kirk Christiansen.

Convention Application.

(Denmark, 28th January, 1953, 3rd March, 1958, and 25th March, 1958).

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Classification 53.9; 81.1.

International Classification A 63 h.

Drawings (2 sheets) attached.

COMPLETE SPECIFICATION.

"IMPROVEMENTS IN AND RELATING TO TOY BUILDING SETS AND BUILDING BLOCKS."

The following statement is a full description of this invention, including the best method of performing it known to me :-

This invention generally relates to toy building sets comprising a plurality of building element and, more particularly, to toy building bricks or blocks comprising a hollow body open at one face and adapted to be connected together by means of projections extending from the faces of the elements and arranged so as to engage protruding portions of an adjacent element when two such elements are assembled.

Toy elements of this kind will be referred to generally as blocks, and the principal object of the invention is to provide improved coupling means for clamping such building blocks together in any desired relative position thus providing for a vast variety of combinations of the blocks for making toy structures of many different kinds and shapes.

Toy building sets comprising a plurality of hollow blocks open at one face and provided with projections or bosses symmetrically disposed on the face opposite the open face are well known per se. In these previously known blocks the said bosses or projections - which will hereinafter be referred to as 'primary projections' - are arranged in two parallel rows and in transverse pairs, so that the primary projections are uniformly spaced apart in both longitudinal and transverse directions. Moreover, the arrangement is such that the overall dimension over each pair of projections closely approximates the width of the cavity of the

block and the overall dimension of each row of projections closely approximates the length of the cavity.

With this arrangement of the primary projections relatively to the dimensions of the cavity two identical blocks may be interlocked in staggered or offset relation.

Moreover, in another type of hollow building blocks which are likewise provided with outwardly extending projections on the side opposite the open face there are provided inwardly extending projections arranged co-axially with the outwardly extending projections, the arrangement being such that the outwardly extending projections are provided with recesses adapted to receive the ends of the inwardly extending projections of another block.

Thus, hollow building blocks provided with inwardly extending projections within the cavity of the block are likewise well-known per se, and such projections will herein-after be referred to as "secondary projections".

The building set and blocks according to the present invention comprises features of both the above mentioned types of blocks, but the mere juxtaposition of primary and secondary projections would not solve the problem of providing improved coupling means for interlocking adjacent blocks in a vast variety of combinations. In fact, in order to solve this problem the relative dimensions and positions of the primary and secondary projections must be interrelated in a specific manner, and according to the main characterizing feature of the invention the positions and dimensions of the secondary projections relatively to the positions and dimensions of the primary projections are such that, in a pair of assembled blocks the lateral face or faces of at least one primary projection of one block will be clamped against the lateral face or faces of at least one secondary projection of the adjacent block.

Fundamentally, the projections need not necessarily be of cylindrical shape - and conveniently the invention actually comprises specific embodiments wherein at least the secondary projections are of a different shape - but if, as in a preferred embodiment, both the primary and the secondary projections are of cylindrical shape, it is possible to define the diameter D_s of the secondary projections s by the diameter D_p of the primary projections p and the width w of the cavity of the hollow block.

According to the invention, this definition is given by the equation

$$D_s = \sqrt{2} \ w - D_p(1 + \sqrt{2}).$$

The advantages obtained by the particular interrelation of primary and secondary projections, which essentially characterise the present invention and various practical arrangements thereof, will be described with reference to the accompanying drawings, in which:

Fig. 1 is a vertical section taken along the line I-I in Fig. 2, through a pair of identical blocks assembled by means of primary and secondary projections according to one practical arrangement of the invention,

Fig. 2 is a horizontal section, taken along the line II-II in Fig. 1,

Fig. 3 is a perspective view of one of the blocks shown in Fig. 1 with the side and end walls removed, so as to clearly show the relative positions of the primary and secondary projections,

Fig. 4 is a similar perspective view showing the assembly of two blocks which are laterally displaced relatively to one another,

Fig. 5 is a similar perspective view wherein the two blocks are displaced relatively to one another in the lengthwise direction,

Fig. 6 is a perspective view showing a modification of the block provided with two

secondary projections of cross-shaped cross section,

Fig. 7 is a plan view of a similar block wherein the secondary projections are tubular and of substantially cross-shaped cross section,

Fig. 8 is a plan view of a further modification of the block wherein the secondary projections are arranged in the interspaces between adjacent pairs of primary projections,

Fig. 9 is a perspective view of a modified block comprising a square base plate with four primary projections, one corner being removed to show the centrally disposed secondary projection,

Fig. 10 is a plan view showing a modification in the assembly of two blocks, the side and end walls of which have been removed to clearly show the relative positions of the primary and secondary projections,

Figs. 11 to 19 are perspective views of a series of modified blocks provided with one or more inclined faces and at least one primary and/or secondary projection,

Figs. 20 and 21 show a pair of similar blocks having neither primary nor secondary projections and which, therefore, do not per se form part of the present invention, and

Fig. 22 is a perspective view showing a roof structure built up by the blocks illustrated in Figs. 11 to 21.

Referring now to the drawings, the bottom of the hollow blocks, which in Figs. 1, 4, 5 and 10 are generally designated by A and B is designated by a and the side and end walls by b and c respectively. The outer face of the bottom a, i.e. the face opposite the open face a, Figs. 11 to 21, of the block is provided with primary projections p and secondary projections s are arranged within the cavity of the block.

In all the Figures, except Figs. 6, 7 and 8, both the primary and secondary projections are cylindrical. Moreover, the secondary projections s are tubular and in a preferred embodiment the internal diameter of the cylindrical cavity t is substantially equal to the diameter of the primary projections p. With this arrangement two blocks A and B may be interlocked by inserting the ends of the primary projections of one block into the recesses t of the secondary projections of the adjacent block, as illustrated in Fig. 10. Although this method of assembly is known per se it presents an additional advantage when combined with the principal feature of the invention, which consists in arranging the primary and secondary projections in the manner specified above.

In the embodiment of Figs. 1-7 and 9 and 10 the arrangement is such that each secondary projection s is disposed co-axially with the centre of a square defined by the four axes of two pairs of adjacent primary projections p. Moreover, the relative dimensions of the projections are such that the cross section of each secondary projection s in the plane of the bottom face of the hollow block touches the four cross sections of the said primary projections p in the said plane.

In Figs. 6, 7 and 8 the secondary projections are designated by s_x, s_y and s_z respectively.

In Figs. 7 and 8 the secondary projections s_y and s_z are provided with slits i for increasing their resiliency, so as to provide for a more efficient clamping effect against the lateral faces of the primary projections of an adjacent element, and similar slits may, of course, be provided in the tubular secondary projections of Figs. 1 to 5.

The building blocks illustrated in Figs. 1 to 10 may be interlocked and combined in a vast number or relative positions for making toy structures of many different kinds and for

shapes. However, they are pre-eminently adapted to various kinds of wall structures.

On the other hand, special blocks are provided for roof structures or other constructions provided with inclined surfaces. Examples of such blocks are illustrated in Figs. 11 to 21. Each of these blocks is provided with at least one inclined face which is generally designated by d. In Figs. 11, 12, 13 and 19 there is one inclined face d, the block having a trapeziform cross section, and in Figs. 14, 15, 17, 18 and 20 there are two inclined faces d₁ and d₂, the common line of intersection between these two faces being designated by f. In Fig. 16 there are four inclined faces d₁, d₂, d₃, d₄, and in Fig. 21 there are three inclined faces d₁, d₂ and d₃.

With a set of building elements as illustrated in Figs. 11 to 21 a roof structure as shown in Fig. 22 may be built by assembling the blocks in the manner explained with reference to the preceding figures. In Fig. 22 the blocks 11 to 21 correspond to the embodiments of Figs. 11 to 21 respectively. It will be noted that in some of these blocks, as for example the one shown in Fig. 11, there is only one row of primary projections p. Consequently, when assembling two such blocks, each secondary projection will be clamped between two adjacent primary projections and one of the side or end walls.

It should be observed that, while all the elements of the building set according to the invention are in the form of hollow blocks a, b, c open at one face and while the side and end walls b and c do in most cases cooperate with the primary and secondary projections in the interlocking of two adjacent blocks, it is theoretically possible to omit said side and end walls as shown in Fig. 3. In fact, two elements as shown in Fig. 3 consisting each of a base plate a and primary and secondary projections but having no side or end walls could be interlocked in various positions, for example as shown in Figs. 1 and 5.

The claims defining the invention are as follows :-

1. A toy building set comprising a plurality of hollow blocks open at one face and adapted to be connected together by means of projections extending from the bottom faces of said blocks, and wherein some of the blocks are provided with at least one projection (primary projection) at the bottom face opposite the open face, and some of the blocks are provided with at least one projection (secondary projection) arranged within the cavity of the block, characterised in that the positions and dimensions of the secondary projections relatively to the positions and dimensions of the primary projections are such that, in a pair of assembled blocks the lateral face or faces of at least one primary projection of one block will be clamped against the lateral face or faces of at least one secondary projection of the adjacent block. (28th January, 1958).

2. A toy building set according to Claim 1, in which the projections are of cylindrical shape, and wherein the secondary projections are arranged in the median plane of the open face of the block, and the diameter of a secondary projection within the cavity of one block is defined by the equation

$$D_s = \sqrt{2} \ w - D_p(1 + \sqrt{2}),$$

in which w is the width of the cavity in one block and D_p is the diameter of a primary projection of an adjacent block. (28th January, 1958).

3. A block for a toy building set, as claimed in Claim 1 or Claim 2,

comprising a hollow parallel-sided body open at one face and provided with primary projections disposed on the bottom face opposite the open face and uniformly spaced apart in both longitudinal and transverse directions, said block comprising at least one secondary projection arranged within the cavity of the block, each secondary projection being disposed co-axially with the center of a square defined by the four axes of two pairs of adjacent primary projections, and the cross section of each secondary projection in the plane of the bottom face of the hollow block contacts the four cross sections of said primary projections in the said plane. (28th January, 1958).

4. A block, as claimed in Claim 3, in which the hollow bottom is of cubical form and provided with four primary projections and one secondary projection. (28th January, 1958).

5. A block, for a toy building set, as claimed in Claim 1 or Claim 2, and comprising a hollow body open at one face and provided with primary projections at the bottom face opposite the open face and with secondary projections arranged within the cavity of the block, the latter having a trapeziform cross section and comprising one row of primary projections disposed in the median plane of the rectangular bottom face opposite the open face of the block, the secondary projections being disposed in the median plane of the open rectangular face and positioned in such a manner relatively to the primary projections that the cross section of each secondary projection in the plane of the bottom face contacts the cross sections in that plane of two adjacent primary projections. (25th March, 1958).

6. A block for a toy building set, as claimed in Claim 1 or Claim 2, and comprising a hollow body of trapeziform cross section open at one face and having a square bottom face opposite the open face, the block being provided with one primary projection disposed co-axially with the center of the square bottom face. (25th March, 1958).

7. A block, as claimed in Claim 6, wherein in that the open face is of square shape and that the block comprises one secondary projection co-axially disposed with the center of the open face. (25th March, 1958).

8. A block for a toy building set, as claimed in Claim 1 or Claim 2, wherein the block comprises a prismatic hollow body of triangular cross section and is provided with at least one secondary projection disposed within the cavity of the block and with its axis in the median plane of said prismatic body. (25th March, 1958).

9. A modification of a block, as claimed in Claim 4, in which one corner of the cubical block is cut away and substituted by two inclined faces of triangular shape defining a groove of wedge-like shape, so as to leave only three primary projections on the outer bottom face of the block. (25th March, 1958).

10. A block, as defined in any one of the preceding claims, in which the secondary projections are of tubular shape. (28th January, 1958).

11. A block for a toy building set, as claimed in Claim 1, in which the cross sections of the secondary projections are substantially cross shaped. (28th January, 1958).

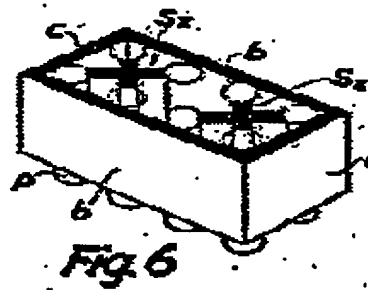
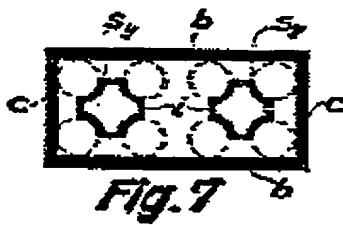
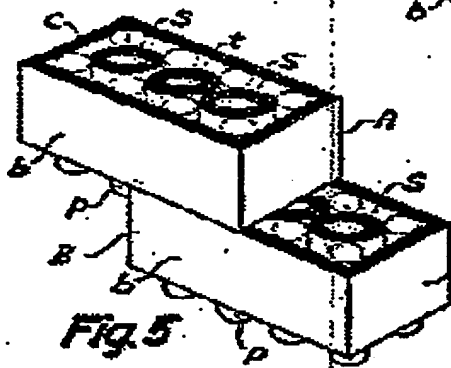
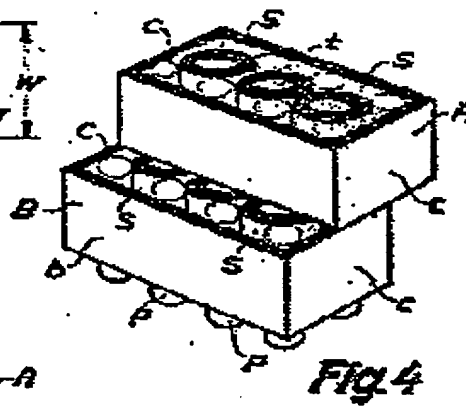
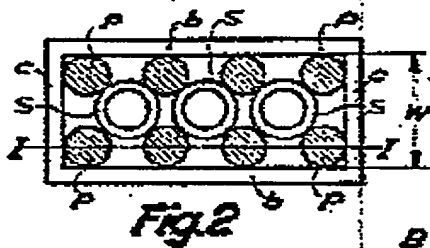
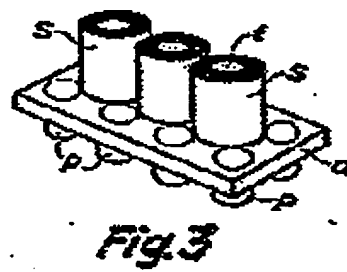
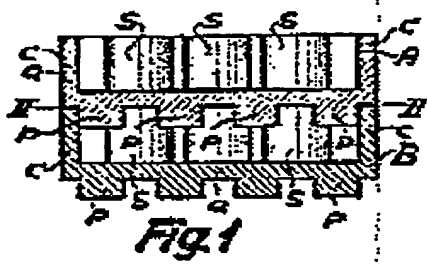
12. A block, as defined in Claim 10, in which the tubular secondary projections are provided with longitudinal slits. (28th January, 1958).
13. A block, as defined in Claim 10, in which the internal diameter of the tubular secondary projections is equal to the diameter of the primary projections. (28th January, 1958).
14. A block for a toy building set, as claimed in Claim 1, characterised in that the secondary projections are arranged in planes determined by the axes of the primary projections and spaced apart at intervals equal to the diameter of the primary projections. (28th January, 1958).
15. A toy building set, substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings. (28th January, 1958).
16. Blocks for toy building sets, substantially as hereinbefore described with reference to and as illustrated by Figs. 1 to 5, or Figs 6 and 7 or Fig. 8 or Fig. 9 or Fig. 10 or any one of Figs. 11 to 19 of the accompanying drawings. (12th January, 1959).

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MELBOURNE.
Patent Attorneys for Applicant.

References:

<u>Serial No.</u>	<u>Application No.</u>	<u>Classification.</u>
163,751	16,206/53	53.9; 81.1
100,283	2433/36	53.9
128,598	23,280/45	53.9.

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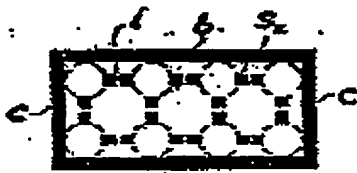


Fig. 8

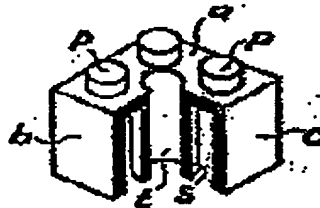


Fig. 9

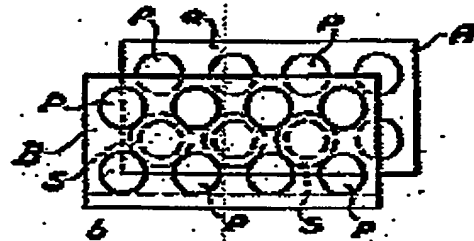


Fig. 10

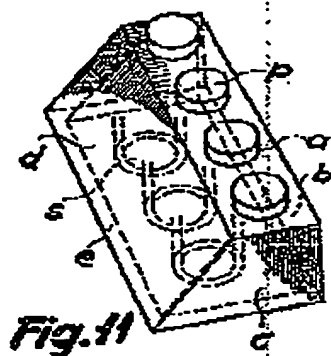


Fig. 11

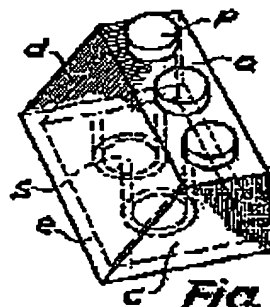


Fig. 12

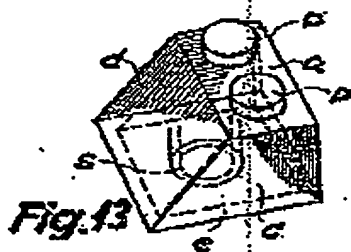


Fig. 13

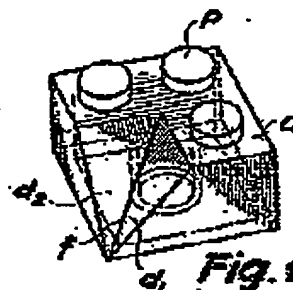


Fig. 14

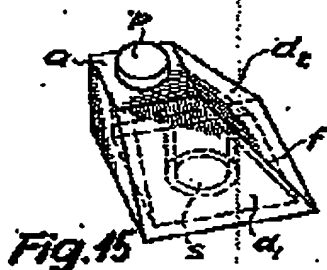


Fig. 15

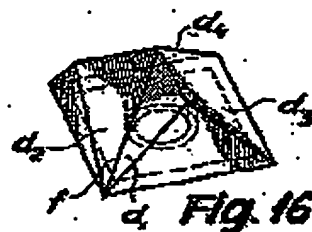


Fig. 16

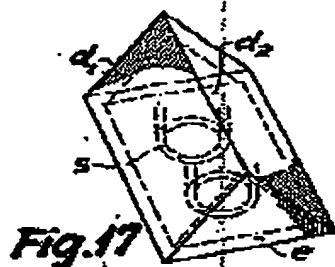


Fig. 17

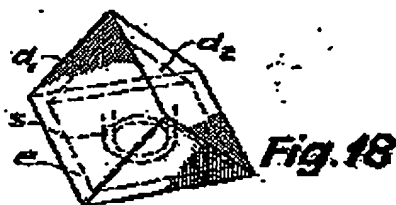


Fig. 18

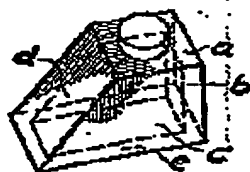


Fig. 19



Fig. 20



Fig. 21

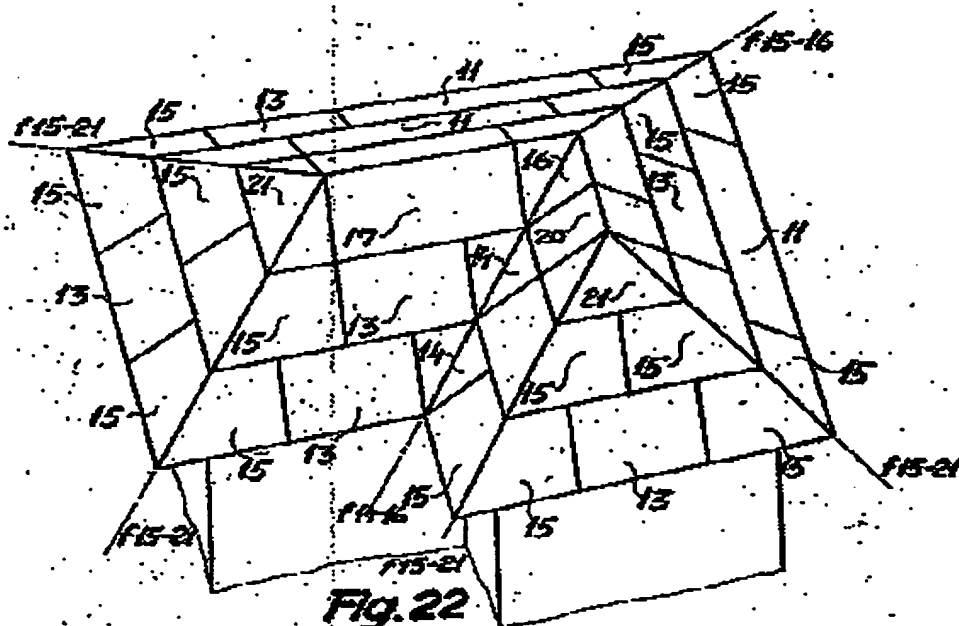


Fig. 22